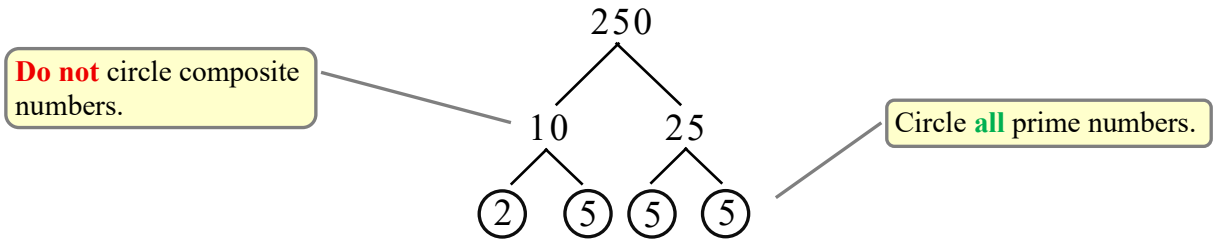
Find Prime Factorization

Example: Find the *prime factorization* of 250.

STEP 1: Begin a *factor tree* by writing 250 at the top and two branches below it.

STEP 2: Ask yourself, "What number times what number is 250?" Use *divisibility rules* to find the two factors. We have choices because 250 is divisible by 2, 5, and 10. We choose 10 to quickly reduce 250. To find the other factor, divide 10 into 250 to get 25.

STEP 3: Now we have the *composite numbers* 10 and 25. Continue down the factor tree by finding the factors of 10 and 25. The factors of 10 are 2 and 5, which are both *prime numbers,* so we circle them. The factors of 25 are 5 and 5, which are both prime numbers and we circle them.

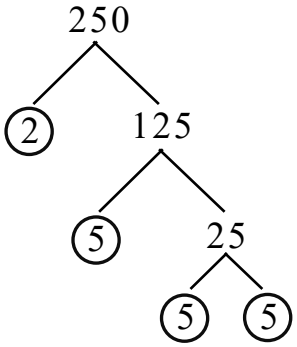


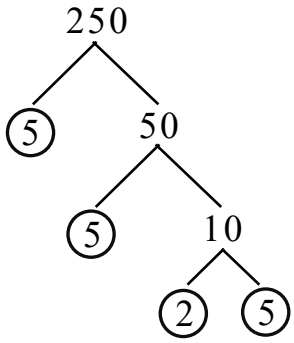
Use the circled prime numbers in the factor tree to list prime factorization: 2 • 5 • 5 • 5

Notes:

- Notice that the instructions say to find the *prime factorization* of 250, which means we are only concerned with the *prime numbers* of 250. We will exclude composite numbers and the number 1, which is neither prime nor composite.
- Knowledge of prime numbers is necessary to solve this type of problem, which is why you must memorize prime numbers 2 through 47.
- Circle the prime numbers as you go down the factor tree. Do not circle the composite numbers.
- We continue down the factor tree until the end of each branch has a circled prime number.
- When the end of every branch has a circled prime number, we are done using the factor tree.
- The answer includes the multiplication dot " • " between each prime number because the format of *prime factorization* must be in *factored form.*
- Although not required, list the prime numbers from smallest to largest.
- Notice that the answer to this problem is in *prime factorization* format as compared to the previous problem of finding *all* the factors of a number which is in a list format separated by commas. The answers (numbers and formats) are completely different. It is a common mistake to confuse these two type of problems.

- For the factor tree, there is no right or wrong way on which factors you choose at each branch. For example, if you started the initial branch with the alternate number combinations shown below, you would still arrive at the same prime factorization.





The prime factorization is the same: $2 \bullet 5 \bullet 5 \bullet 5$